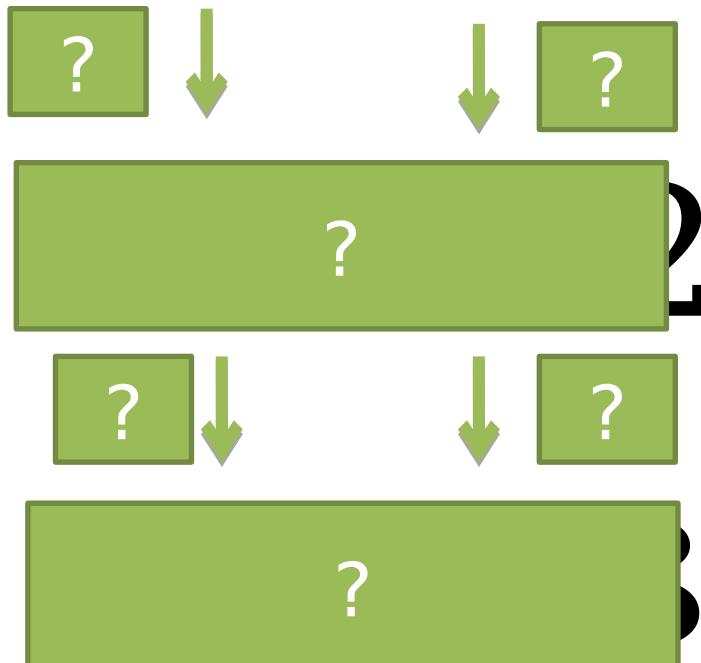


Solving

Note: You can probably see the answer to this in your head because the equation is relatively simple, but this full method is crucial when things become more complicated

$$4n + 20 = 32$$



Tip: Many students find writing these operations between each equation helpful to remind them what they're doing to each side, but you'll eventually want to wean yourself off these.

Strategy: Do the opposite operation to 'get rid of' items surrounding our variable.

$$x + 4 \xrightarrow{\quad ? \quad} x$$

$$3y \xrightarrow{\quad ? \quad} y$$

$$\frac{z}{6} \xrightarrow{\quad ? \quad} z$$

Test Your Understanding

Solve the following.

1

?

2

?

3

?

4

?

What happens if variable appears on both sides?

$$5a + 3 = 2a + 9$$

What might our strategy be?

?

What happens if variable appears on both sides?

$$5a + 3 = 2a + 9$$

More Examples

$$11x - 4 = 2x - 13$$

$$3y + 4 = 8y - 5$$

$$5 = 3 - 3x$$

Test Your Understanding

?

?

?

?

?

?

?

?

?

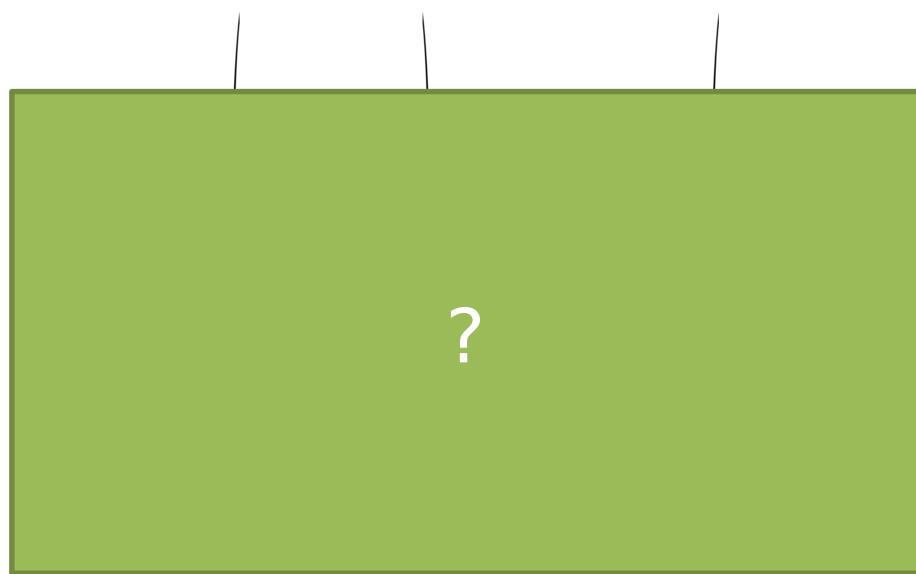
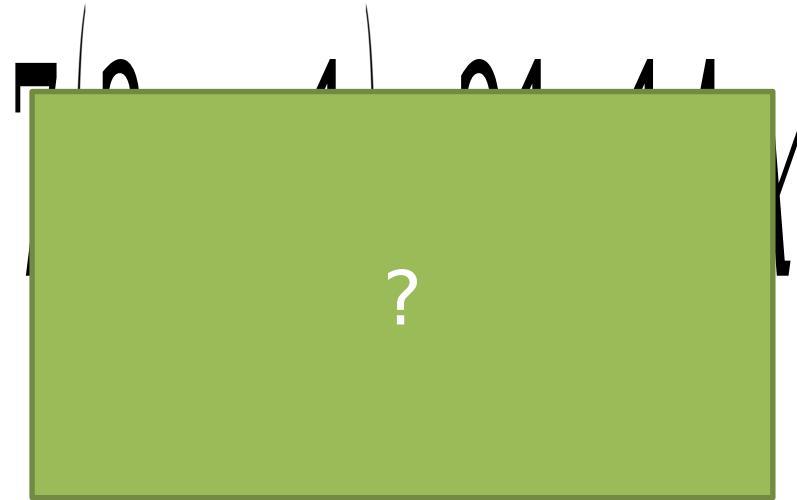
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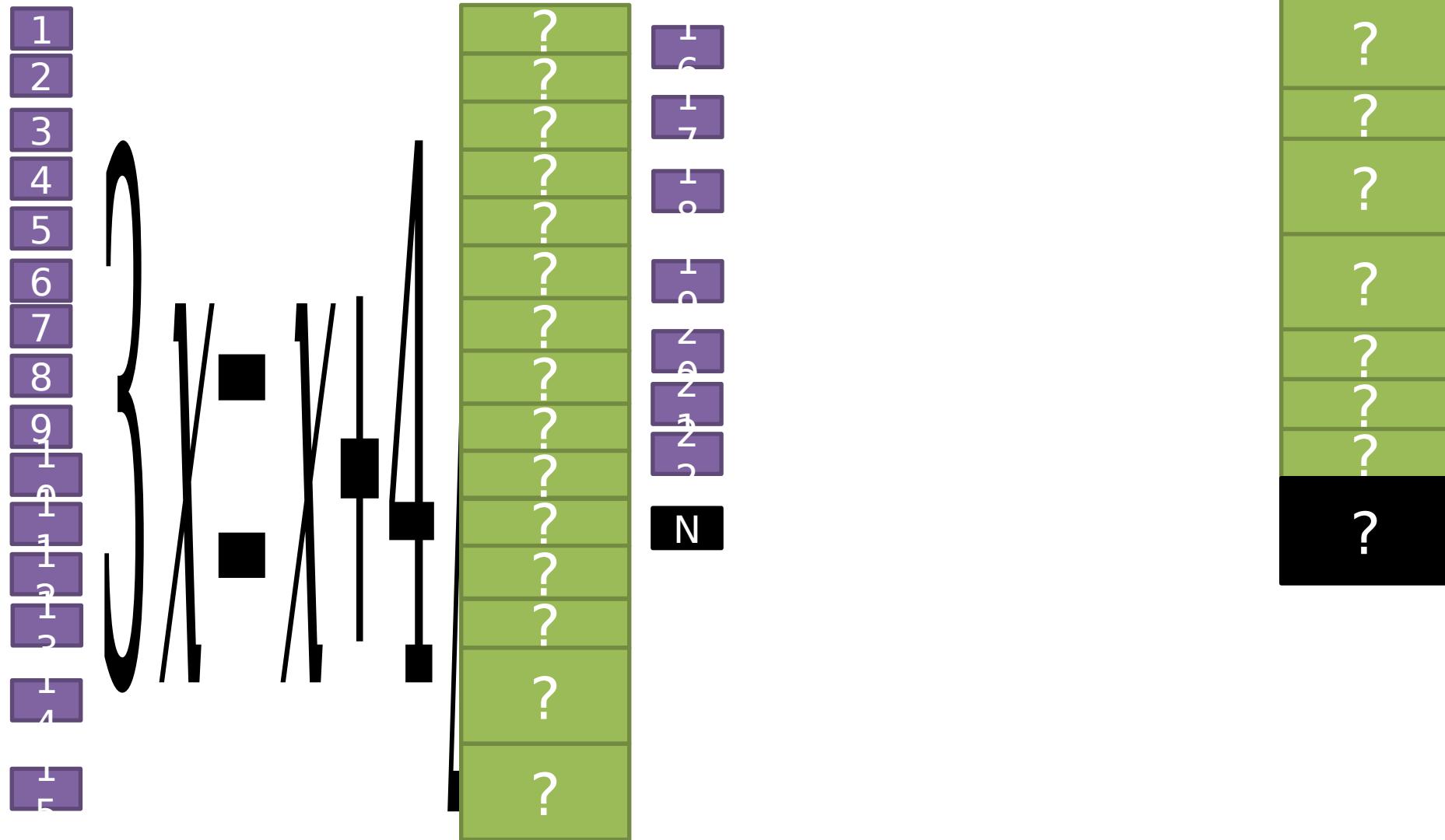
?

Test Your Understanding



Exercise 1

Solve the following.



RECAP :: Forming/Solving Process

Worded problem

Granny swears that she is getting younger. She has calculated that she is four times as old as I am now, but remember that 5 years ago she was five times as old as I was at that time. What is the sum of our ages now?



Stage 1:

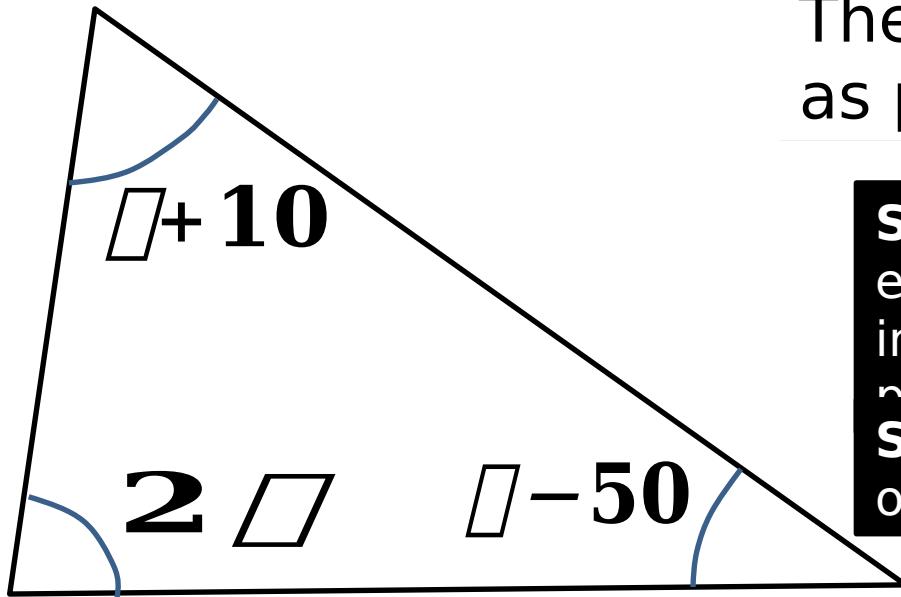
Represent

Let x be my age
and y be Granny's age.

Stage 2: 'Solve'

equation(s) to find

Example



The angles of a triangle are as pictured. Determine .

Step 1: Find two different expressions for the thing of interest (one of them often a provided number)

Step 2: Set them equal to each other

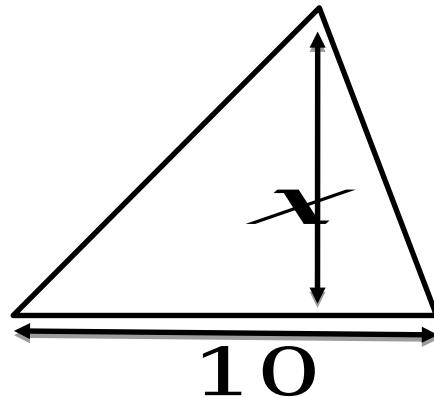
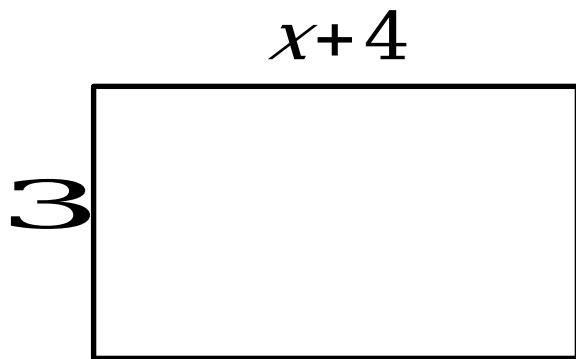
Step 3: Solve!

Expr 1?

Expr 2?

Solve!

Another Example



The rectangle and triangle have the same area. Determine the width of the rectangle.

Step 1: Find two different expressions for the thing of interest (one of them often a provided number)

Step 2: Set them equal to each other

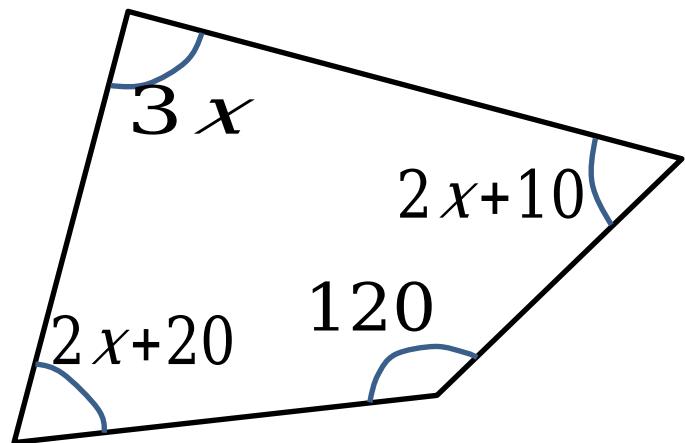
Step 3: Solve!

Expr 1?

Expr
2?

Solve!

Check Your Understanding



1

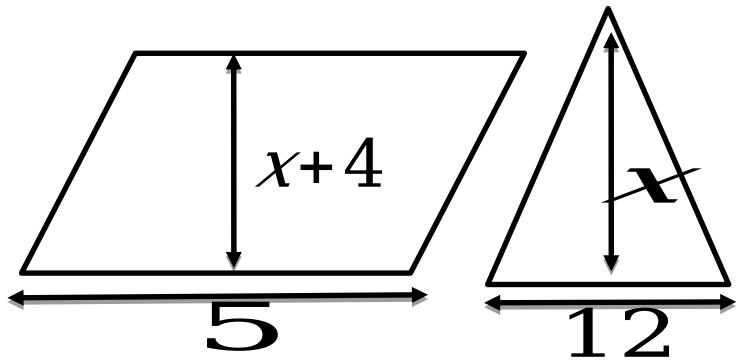
The following diagram shows the angles of a quadrilateral. Determine

Expr 1?

Expr 2?

Solve!

$$10 + 120 = 360$$



2

The area of the triangle is 1 more than the area of the parallelogram. Determine

5

Expr 1?

Expr 2?

Solve!

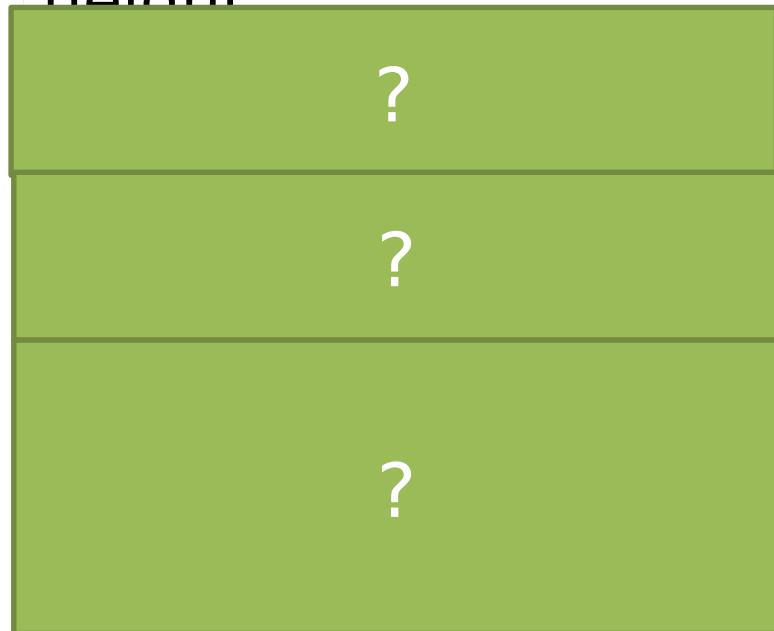
N

[JMO 1999 A9] Skimmed milk contains 0.1% fat and pasteurised whole milk contains 4% fat. When 6 litres of skimmed milk are mixed with x litres of pasteurised whole milk, the fat content of the resulting

?

Forming the expressions yourself

Thomas is 5m shorter than Sebastian. Raul is double the height of Sebastian. Their combined height is 35m. Find Sebastian's height



Use the word “Let ...” to define your variable(s)! You want a clear narrative while being as concise as possible.



S's height is

10



More Examples

[JMC 2013 Q7] After tennis training, Andy collects twice as many balls as Roger and five more than Maria. They collect 35 balls in total.

?



[TMC Regional 2014 Q9] In a list of seven consecutive numbers a quarter of the smallest number is five less than a third of the largest number. What is the value of

?

Test Your Understanding



1

The width of the rectangle is three times the height. The total perimeter is 56m. Determine its height.



Bro

Reminder: You should usually start with “Let ...”

2

In 4 years time I will be 3 times as old as I was 10 years ago. How old am I?



Exercise 2

(Teacher Note: For printout see “Year 7 – Equations Ex3” - <http://www.drfrostmaths.com/resource.php?id=11640>

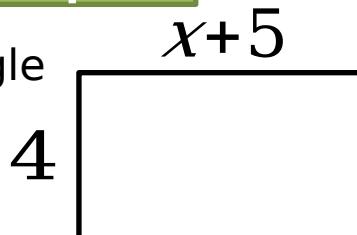
1 Three angles in a triangle are and .
What is ?

?

2 Two angles on a straight line are and .
What is ?

?

3 The area of this rectangle is 48. Determine .



4 An equilateral triangle has lengths . What is ?

?

5 [JMC 1998 Q18] The three angles of a triangle are , , . Which statement about the triangles is correct? It is:
A right-angled isosceles
B right-angled, but not isosceles
C equilateral
D obtuse-angled and isosceles
E none of A-D

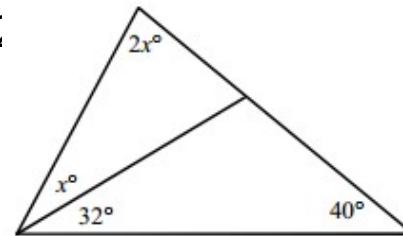
6 The sum of 5 consecutive numbers is 200. What is the

?

realise the middle number is the average of the 5, i.e. 40)

7

[JMO :
value



the
hown?

?

Solution: 36

?

The perimeter of this rectangle is 44. What is x ?

Solu



$x-2$

s ?

Exercise 2

9 In 5 years time I will be 5 times as old as I was 11 years ago. Form a suitable equation, and hence determine my age.

?

10 In 6 years time I will be twice as old as I was 8 years ago. Determine my age.

?

11 I have three times as many cats as Alice but Bob has 7 less cats than me. In total we have 56 cats. How many cats do I have?

2 ?

12 [TMC Final 2012 Q1] A Triple Jump consists of a hop, step and jump. The length of Keith's step was three-quarters of the length of his hop and the length of his jump was half the length of his step. If the total length of Keith's triple jump was 17m, what was the length of his hop, in metres?

Solution: 8 metres

13

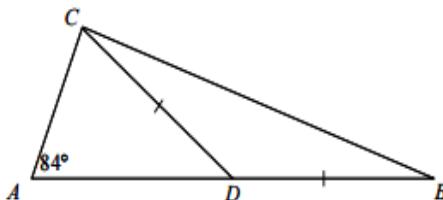
[JMO 2003 A6] Given a “starting” number, you double it and add 1, then divide the answer by 1 less than the starting number to get the “final” number. If you start with 2, your final number is 5. If you start with 4, your final

number is 11. If you start with 6, your final number is 13. If you start with 8, your final number is 15. If you start with 10, your final number is 17. If you start with 12, your final number is 19. If you start with 14, your final number is 21. If you start with 16, your final number is 23. If you start with 18, your final number is 25. If you start with 20, your final number is 27. If you start with 22, your final number is 29. If you start with 24, your final number is 31. If you start with 26, your final number is 33. If you start with 28, your final number is 35. If you start with 30, your final number is 37. If you start with 32, your final number is 39. If you start with 34, your final number is 41. If you start with 36, your final number is 43. If you start with 38, your final number is 45. If you start with 40, your final number is 47. If you start with 42, your final number is 49. If you start with 44, your final number is 51. If you start with 46, your final number is 53. If you start with 48, your final number is 55. If you start with 50, your final number is 57. If you start with 52, your final number is 59. If you start with 54, your final number is 61. If you start with 56, your final number is 63. If you start with 58, your final number is 65. If you start with 60, your final number is 67. If you start with 62, your final number is 69. If you start with 64, your final number is 71. If you start with 66, your final number is 73. If you start with 68, your final number is 75. If you start with 70, your final number is 77. If you start with 72, your final number is 79. If you start with 74, your final number is 81. If you start with 76, your final number is 83. If you start with 78, your final number is 85. If you start with 80, your final number is 87. If you start with 82, your final number is 89. If you start with 84, your final number is 91. If you start with 86, your final number is 93. If you start with 88, your final number is 95. If you start with 90, your final number is 97. If you start with 92, your final number is 99. If you start with 94, your final number is 101. If you start with 96, your final number is 103. If you start with 98, your final number is 105. If you start with 100, your final number is 107.

Exercise 2



[JMO 2012 A3] In triangle ABC , D is a point on BC such that $AD = BD$ and $CD = 2AB$. What is the size of $\angle A$?



?



[JMC 2012 Q24] After playing 500 games, my success rate in Spider Solitaire is 49%. Assuming I win every game from now on, how many extra games do I need to play in order that my success rate increases to

?



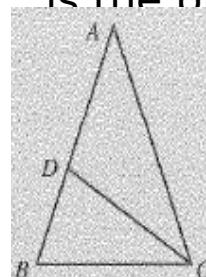
[JMO 2003 A9] A large container holds 14 litres of a solution which is 25% antifreeze, the remainder being water. How many litres of antifreeze must be added to the container to make a solution which is 30% antifreeze?
Let x be the amount of antifreeze

?



(Note: it's easier to just exploit the fact it's multiple choice and try the options!)

[JMO 2008 A9] In the diagram, is the bisector of angle

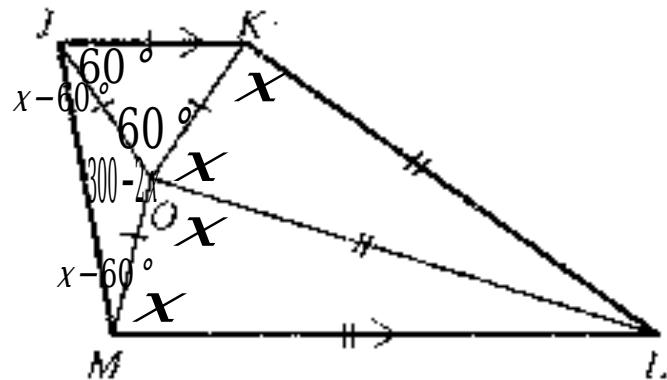


?

Exercise 2



[JMO 2010 A10] In the diagram, JK and ML are parallel. $\angle JKL = x$. Find the size of angle MLK .



?



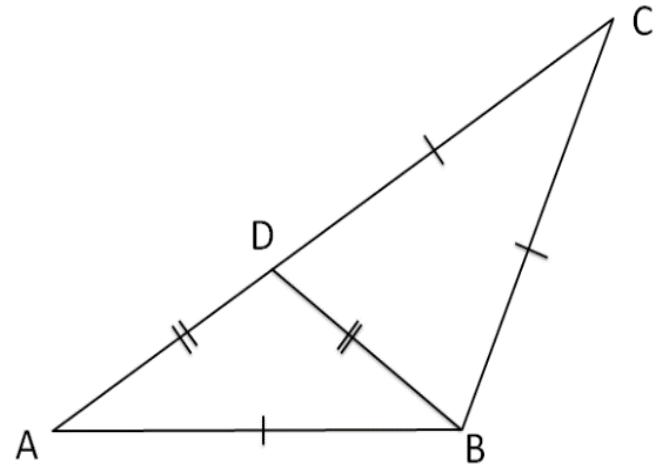
[JMO 2013 B2] Pippa thinks of a number. She adds 1 to it to get a second number. She then adds 2 to the second number to get a third number, adds 3 to the third to get a fourth, and finally adds 4 to the fourth to get a fifth number. Pippa's brother Ben also thinks of a number but he subtracts 1 to get a second. He then subtracts 2 from the second to get a third, and so on until he has five numbers. They discover that the sum of Pippa's five numbers is the same as the sum of Ben's five numbers. What is the

?

Exercise 2



[JMO 2005 B4] In this figure is a straight line and . Also, .
Find the size of .
(Full proof needed)



Full proof:

?